CLAIMS

What is claimed is:

1. A method of providing a retroreflective coating system on a substrate, said method comprising the steps of:

(A) applying a color-providing composition to the substrate thereby forming an uncured film layer of the color-providing composition; and

(B) applying an at least partially-transparent clearcoat composition wet-on-wet to the uncured film layer of the color-providing composition thereby forming an uncured film layer of the clearcoat composition on the uncured film layer of the color-providing composition;

wherein at least one of the color-providing composition and the clearcoat composition is cross-linkable, and at least one of the color-providing composition and the clearcoat composition comprises retroreflective microspheres to provide the retroreflective coating system on the substrate.

2. A method as set forth in claim 1 wherein the step of (A) applying the color-providing composition comprises the steps of:

(A)(I) applying a first color-providing composition to the substrate thereby forming an uncured film layer of the first color-providing composition; and

(A)(II) applying a second color-providing composition wet-on-wet to the uncured layer of the first color-providing composition thereby forming an uncured film layer of

the second color-providing composition on the uncured film layer of the first color-providing composition.

3. A method as set forth in claim 2 wherein the step of (A)(I) applying the first color-providing composition to the substrate is further defined as applying a pigmented basecoat composition to the substrate such that the uncured film layer of the first color-providing composition is formed of the pigmented basecoat composition.

4. A method as set forth in claim 3 wherein the step of applying the pigmented basecoat composition to the substrate is further defined as applying a pigmented basecoat composition comprising from 5 to 40 parts by weight of pigment based on 100 parts by weight of the pigmented basecoat composition.

5. A method as set forth in claim 3 wherein the step of applying the pigmented basecoat composition to the substrate is further defined as applying a pigmented basecoat composition comprising aluminum pigment.

6. A method as set forth in claim 3 wherein the step of (A)(II) applying the second color-providing composition wet-on-wet to the uncured film layer of the first color-providing composition is further defined as applying a mid-coat composition wet-on-wet to the uncured film layer of the pigmented basecoat composition wherein the mid-coat composition comprises the retroreflective microspheres and the uncured film layer of the second color-providing composition is formed of the mid-coat composition.

7. A method as set forth in claim 6 wherein the step of applying the mid-coat composition is further defined as applying a mid-coat composition comprising from 1 to 40 parts by weight of the retroreflective microspheres based on 100 parts by weight of the mid-coat composition.

8. A method as set forth in claim 6 wherein the step of (B) applying the at least partially-transparent clearcoat composition is further defined as applying the clearcoat composition wet-on-wet-on-wet to the uncured film layers of the mid-coat composition and the pigmented basecoat composition to at least partially cover the retroreflective microspheres in the mid-coat composition.

9. A method as set forth in claim 8 further comprising the step of simultaneously curing the uncured film layers of the pigmented basecoat composition, the mid-coat composition, and the clearcoat composition to provide the retroreflective coating system with the retroreflective microspheres in the mid-coat composition.

10. A method as set forth in claim 9 wherein the step of simultaneously curing the uncured film layers to provide the retroreflective coating system is further defined as simultaneously curing the uncured film layers to establish a 60 degree gloss for the retroreflective coating system of at least 75, as defined by ASTM D523-89 (Re-Approved 1999).

11. A method as set forth in claim 1 wherein the step of (A) applying the color-providing composition is further defined as applying a pigmented basecoat

composition to the substrate such that the uncured film layer of the first color-providing composition is formed of the pigmented basecoat composition.

12. A method as set forth in claim 11 wherein the step of (B) applying the at least partially-transparent clearcoat composition is further defined as applying the clearcoat composition wet-on-wet to the uncured film layer of the pigmented basecoat composition wherein the clearcoat composition comprises the retroreflective microspheres.

13. A method as set forth in claim 12 further comprising the step of simultaneously curing the uncured film layers of the pigmented basecoat composition and the clearcoat composition to provide the retroreflective coating system with the retroreflective microspheres in the clearcoat composition.

14. A method as set forth in claim 13 wherein the step of simultaneously curing the uncured film layers to provide the retroreflective coating system is further defined as simultaneously curing the uncured film layers to establish a 60 degree gloss for the retroreflective coating system of less than 75, as defined by ASTM D523-89 (Re-Approved 1999).

15. A method as set forth in claim 13 further comprising the step applying a second at least partially-transparent clearcoat composition to the cured film layers of the clearcoat composition and the pigmented basecoat composition thereby forming an

uncured film layer of the second clearcoat composition wherein the second clearcoat composition is free of retroreflective microspheres.

16. A method as set forth in claim 15 further comprising the step of curing the uncured film layer of the second clearcoat composition, after the uncured film layers of the pigmented basecoat composition and the clearcoat composition have been simultaneously cured, to provide the retroreflective coating system with the retroreflective microspheres in the clearcoat composition.

17. A method as set forth in claim 12 further comprising the step applying a second at least partially-transparent clearcoat composition wet-on-wet-on-wet to the uncured film layers of the clearcoat composition and the pigmented basecoat composition thereby forming an uncured film layer of the second clearcoat composition wherein the second clearcoat composition is free of retroreflective microspheres.

18. A method as set forth in claim 17 further comprising the step of simultaneously curing the uncured film layers of the pigmented basecoat composition, the clearcoat composition comprising the retroreflective microspheres, and the second clearcoat composition free of retroreflective microspheres to provide the retroreflective coating system with the retroreflective microspheres in the clearcoat composition.

19. A method as set forth in claim 1 wherein the step of (A) applying the color-providing composition is further defined as applying a pigmented basecoat composition to the substrate wherein the pigmented basecoat composition comprises the

retroreflective microspheres and the uncured film layer of the first color-providing composition is formed of the pigmented basecoat composition comprising the retroreflective microspheres.

20. A method as set forth in claim 19 wherein the step of (B) applying the at least partially-transparent clearcoat composition is further defined as applying the clearcoat composition wet-on-wet to the uncured film layer of the pigmented basecoat composition to at least partially cover the retroreflective microspheres in the pigmented basecoat composition.

21. A method as set forth in claim 18 further comprising the step of simultaneously curing the uncured film layers of the pigmented basecoat composition comprising the retroreflective microspheres and the clearcoat composition to provide the retroreflective coating system with the retroreflective microspheres in the pigmented basecoat composition.

22. A method as set forth in claim 1 wherein the retroreflective microspheres have an average diameter of from 10 to 100 microns.

23. A method as set forth in claim 1 wherein the retroreflective microspheres have a refractive index of from 1.5 to 2.2.

24. A method as set forth in claim 1 wherein the step of (A) applying the color-providing composition to the substrate is further defined as applying a color-

providing composition comprising from 1 to 40 parts by weight of the retroreflective spheres based on 100 parts by weight of the color-providing composition.

25. A method as set forth in claim 1 wherein the step of (B) applying the at least partially-transparent clearcoat composition is further defined as applying an at least partially-transparent clearcoat composition comprising from 1 to 40 parts by weight of the retroreflective microspheres based on 100 parts by weight of the clearcoat composition.

26. A method as set forth in claim 1 wherein the step of (A) applying the color-providing composition to the substrate is further defined as applying a color-providing composition comprising from 5 to 40 parts by weight of pigment based on 100 parts by weight of the color-providing composition.

27. A method as set forth in claim 1 wherein;

the step of (A) applying the color-providing composition is further defined as spray applying the color-providing composition, and

the step of (B) applying the at least partially-transparent clearcoat composition is further defined as spray applying the at least partially-transparent clearcoat composition.

28. A method as set forth in claim 1 wherein the step of (A) applying the color-providing composition to the substrate is further defined as applying the color-providing composition to an automotive body panel.

29. A method as set forth in claim 1 further comprising the step of simultaneously curing the uncured film layers of the color-providing composition and the clearcoat composition such that at least one of the color-providing composition and the clearcoat composition cross-links to provide the retroreflective coating system.

30. A method as set forth in claim 29 wherein the step of simultaneously curing the uncured film layers is further defined as simultaneously curing the uncured film layers to establish a 60 degree gloss for the retroreflective coating system of at least 75, as defined by ASTM D523-89 (Re-Approved 1999).

31. A method as set forth in claim 29 wherein the step of simultaneously curing the uncured film layers is further defined as simultaneously curing the uncured film layers to establish a 60 degree gloss for the retroreflective coating system of less than 75, as defined by ASTM D523-89 (Re-Approved 1999).

32. A method as set forth in claim 29 wherein the step of simultaneously curing the uncured film layers is further defined as simultaneously curing the uncured film layers to establish a film build of the retroreflective coating system.

33. A method as set forth in claim 32 wherein the step of simultaneously curing the uncured film layers to establish the film build is further defined as simultaneously curing the uncured film layers to establish a film build of the retroreflective coating system of from 10 to 100 microns.

34. A method as set forth in claim 32 further comprising the step of removing a portion of the film build of the retroreflective coating system after the uncured film layers of the color-providing composition and the clearcoat composition have been simultaneously cured for increasing exposure of the retroreflective microspheres to an external light source.

35. A method as set forth in claim 34 wherein the step of removing the portion of the film build of the retroreflective coating system is further defined as sanding the portion of the film build of the retroreflective coating system after the uncured film layers have been simultaneously cured.

36. A method as set forth in claim 1 wherein the step of (A) applying the color providing composition is further defined as applying a color-providing composition comprising phosphorescent pigment.

37. A method as set forth in claim 1 wherein the step of (B) applying the at least partially-transparent clearcoat composition is further defined as applying a clearcoat composition comprising phosphorescent pigment.

38. A retroreflective coating system comprising:

a substrate;

a color-providing film layer formed from a color-providing composition applied to said substrate; and

an at least partially-transparent clearcoat film layer formed from an at least partially-transparent clearcoat composition applied wet-on-wet to said color-providing composition as said color-providing composition is uncured;

wherein at least one of said color-providing composition and said clearcoat composition is cross-linkable, and at least one of said color-providing composition and said clearcoat composition comprises retroreflective microspheres.

39. A retroreflective coating system as set forth in claim 38 wherein said color-providing film layer comprises a first color-providing film layer and a second color-providing film layer different from said first color-providing film layer.

40. A retroreflective coating system as set forth in claim 39 wherein said first color-providing film layer is further defined as a pigmented basecoat film layer formed from a pigmented basecoat composition applied to said substrate.

41. A retroreflective coating system as set forth in claim 40 wherein said pigmented basecoat composition comprises from 5 to 40 parts by weight of pigment based on 100 parts by weight of said pigmented basecoat composition.

42. A retroreflective coating system as set forth in claim 40 wherein said pigmented basecoat composition comprises aluminum pigment.

43. A retroreflective coating system as set forth in claim 40 wherein said second color-providing film layer is further defined as a mid-coat film layer formed from a mid-coat composition comprising said retroreflective microspheres and being applied wet-on-wet to said pigmented basecoat composition as said pigmented basecoat composition is uncured.

44. A retroreflective coating system as set forth in claim 43 wherein said mid-coat composition comprises from 1 to 40 parts by weight of said retroreflective microspheres based on 100 parts by weight of said mid-coat composition.

45. A retroreflective coating system as set forth in claim 43 wherein said clearcoat composition is applied wet-on-wet-on-wet to said mid-coat composition and said pigmented basecoat composition to at least partially cover said retroreflective microspheres in said mid-coat composition.

46. A retroreflective coating system as set forth in claim 45 wherein said pigmented basecoat composition, said mid-coat composition, and said clearcoat composition are simultaneously cured to form said pigmented basecoat film layer, said mid-coat film layer, and said clearcoat film layer, respectively.

47. A retroreflective coating system as set forth in claim 46 having a 60 degree gloss of at least 75, as defined by ASTM D523-89 (Re-Approved 1999).

48. A retroreflective coating system as set forth in claim 38 wherein said color-providing film layer is further defined as a pigmented basecoat film layer formed from a pigmented basecoat composition applied to said substrate.

49. A retroreflective coating system as set forth in claim 48 wherein said clearcoat composition comprises said retroreflective microspheres and is applied wet-on-wet to said pigmented basecoat composition as said pigmented basecoat composition is uncured.

50. A retroreflective coating system as set forth in claim 49 wherein said pigmented basecoat composition and said clearcoat composition are simultaneously cured to form said pigmented basecoat film layer and said clearcoat film layer, respectively.

51. A retroreflective coating system as set forth in claim 50 having a 60 degree gloss of less than 75, as defined by ASTM D523-89 (Re-Approved 1999).

52. A retroreflective coating system as set forth in claim 50 further comprising a second at least partially-transparent clearcoat film layer formed from a second at least partially-transparent clearcoat composition applied to said clearcoat film layer and said pigmented basecoat film layer wherein said second clearcoat composition is free of retroreflective microspheres.

53. A retroreflective coating system as set forth in claim 52 wherein said second clearcoat composition is cured to form said second clearcoat film layer.

54. A retroreflective coating system as set forth in claim 49 further comprising a second at least partially-transparent clearcoat film layer formed from a second at least partially-transparent clearcoat composition applied wet-on-wet-on-wet to said clearcoat composition and said pigmented basecoat composition wherein said second clearcoat composition is free of retroreflective microspheres.

55. A retroreflective coating system as set forth in claim 54 wherein said pigmented basecoat composition, said clearcoat composition, and said second clearcoat composition are simultaneously cured to form said pigmented basecoat film layer, said clearcoat film layer, and said second clearcoat film layer, respectively.

56. A retroreflective coating system as set forth in claim 38 wherein said color-providing film layer is further defined as a pigmented basecoat film layer formed from a pigmented basecoat composition comprising said retroreflective microspheres and being applied to said substrate.

57. A retroreflective coating system as set forth in claim 56 wherein said clearcoat composition is applied wet-on-wet to said pigmented basecoat composition to at least partially cover said retroreflective microspheres in said pigmented basecoat composition.

58. A retroreflective coating system as set forth in claim 57 wherein said pigmented basecoat composition and said clearcoat composition are simultaneously

cured to form said pigmented basecoat film layer and said clearcoat film layer, respectively.

59. A retroreflective coating system as set forth in claim 38 wherein said retroreflective microspheres have an average diameter of from 10 to 100 microns.

60. A retroreflective coating system as set forth in claim 38 wherein said retroreflective microspheres have a refractive index of from 1.5 to 2.2.

61. A retroreflective coating system as set forth in claim 38 wherein said color-providing composition comprises from 1 to 40 parts by weight of said retroreflective microspheres based on 100 parts by weight of said color-providing composition.

62. A retroreflective coating system as set forth in claim 38 wherein said clearcoat composition comprises from 1 to 40 parts by weight of said retroreflective microspheres based on 100 parts by weight of said clearcoat composition.

63. A retroreflective coating system as set forth in claim 38 wherein said color-providing composition comprises from 5 to 40 parts by weight of pigment based on 100 parts by weight of said color-providing composition.

64. A retroreflective coating system as set forth in claim 38 wherein said color-providing composition is spray applied to said substrate, and said clearcoat composition is spray applied wet-on-wet to said color-providing composition.

65. A retroreflective coating system as set forth in claim 38 wherein said substrate is an automotive body panel.

66. A retroreflective coating system as set forth in claim 38 wherein said color-providing composition and said clearcoat composition are simultaneously cured to form said color-providing film layer and said clearcoat film layer, respectively, wherein at least one of said color-providing composition and said clearcoat composition cross-links as a result of the cure.

67. A retroreflective coating system as set forth in claim 66 having a 60 degree gloss of at least 75, as defined by ASTM D523-89 (Re-Approved 1999).

68. A retroreflective coating system as set forth in claim 66 having a 60 degree gloss of less than 75, as defined by ASTM D523-89 (Re-Approved 1999).

69. A retroreflective coating system as set forth in claim 66 having a film build of from 10 to 100 microns.

70. A retroreflective coating system as set forth in claim 69 wherein a portion of said film build is removed after said color-providing composition and said clearcoat composition have been simultaneously cured to increase exposure of said retroreflective microspheres to an external light source.

71. A retroreflective coating system as set forth in claim 69 wherein a portion of said clearcoat film layer is sanded after said color-providing composition and said

clearcoat composition have been simultaneously cured to increase exposure of said retroreflective microspheres to an external light source.

72. A retroreflective coating system as set forth in claim 38 wherein at least one of said color-providing composition and said clearcoat composition comprises phosphorescent pigment.